

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
30 September 2004 (30.09.2004)

PCT

(10) International Publication Number
WO 2004/083546 A1

(51) International Patent Classification⁷: E04B 2/96

(21) International Application Number:
PCT/IB2004/000754

(22) International Filing Date: 16 March 2004 (16.03.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
UD2003A000058 17 March 2003 (17.03.2003) IT

(71) Applicant (for all designated States except US): AL-
PROGETTI SRL [IT/IT]; Via Ressel, 5, F-34018 SAN
DORLIGO DELLA VALLE (IT).

(72) Inventor; and

(75) Inventor/Applicant (for US only): FERRO, Nicolò
[IT/IT]; Via Campo Marzio, 4, I-34100 TRIESTE (IT).

(74) Agent: PETRAZ, Gilberto; GLP Srl, Piazzale Cavedalis,
6/2, I-33100 Udine (IT).

(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,
KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,
MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG,
PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM,
ZW.

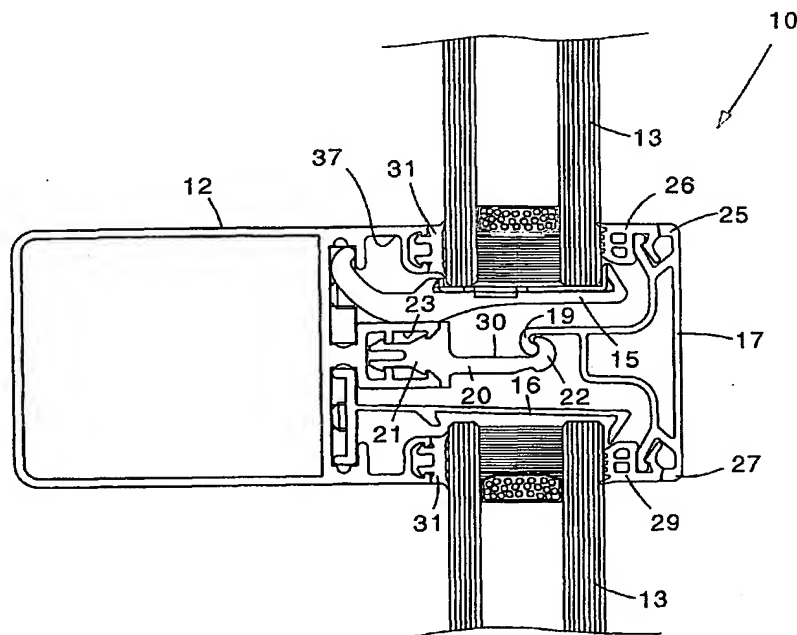
(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), Euro-
pean (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR,
GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
ML, MR, NE, SN, TD, TG).

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.

(54) Title: METHOD TO ASSEMBLE CURTAIN WALLS AND CURTAIN WALL ADOPTING THE METHOD



(57) Abstract: Curtain wall (10) comprising a reticular supporting structure, provided with uprights (11) and cross-pieces (12), and covering elements (13) attached to the supporting structure. The uprights (11) and the crosspieces (12) include first attachment members (22) for closure profiles (17) positioned between two adjacent covering elements (13) and provided with mating second attachment members (19).

- 1 -

"METHOD TO ASSEMBLE CURTAIN WALLS AND CURTAIN WALL ADOPTING
THE METHOD"

* * * * *

FIELD OF THE INVENTION

5 The present invention concerns a method to assemble
curtain walls for buildings, and a curtain wall assembled
with this method.

BACKGROUND OF THE INVENTION

10 Curtain walls for buildings generally comprise a
reticular supporting structure, consisting of uprights and
cross-pieces, on which the covering elements are assembled,
for example glass panels or sheets, or other suitable
material.

15 The uprights and cross-pieces consist of metal
profiles, generally made of aluminum, with which supporting
means are associated in order to position and attach the
covering elements.

20 On the visible side of the wall, in order to close the
horizontal and vertical gaps that form between adjacent
sheets, closure profiles or stoppers are generally
assembled. To apply a closure profile of a known type,
however, it is necessary to screw in a relative first
element, known as presser, to the uprights and cross-
pieces, with a screw about every 20 cm, and then apply in
25 snap-in manner a second covering element to hide the heads
of the screws and the anti-aesthetic parts of the first
element. This entails both the need for prior holes on the
presser elements and also a double operation during the
assembly step, with a consequent extension of the execution
30 times.

Another disadvantage is that the condensation that
forms and the water that filters, especially in the cross-
pieces, tends to stagnate between the cross-piece and the

CONFIRMATION COPY

- 2 -

closure profile, creating problems connected to infiltrations of water and humidity inside the wall, and the consequent formation of mold or otherwise.

5 Curtain walls, and methods to assemble such curtain walls, which have the features of, respectively, the preamble of independent claims 3 and 1, are disclosed in US-A-5,839,236, US-A-4,672,784 and EP-A-644.311.

10 One purpose of the present invention is to perfect an assembly method which allows to assemble rapidly and without needing prior holes a closure profile onto uprights and cross-pieces of a curtain wall. Another purpose is to achieve a curtain wall provided with constraining means that allow a rapid and simple attachment of the closure profile with the relative cross-piece and/or upright and,
15 at the same time, an effective discharge of the filtered water and the condensation that has formed inside the elements of the reticule of the curtain wall.

20 The Applicant has devised, tested and embodied the present invention in order to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

25 The present invention is set forth and characterized in the main claims, while the dependent claims describe other features of the invention or variants of the main embodiment.

30 According to the invention, the cross-pieces and/or uprights of the curtain wall include first attachment means with which second attachment means cooperate, said second attachment means being provided in the closure profiles in order to obtain a rapid reciprocal snap-in attachment. The first attachment means face towards the outer side of the curtain wall and are arranged in the gap that forms between

two adjacent covering sheets.

Here, and in the following description, with the term "inner" we mean the side of the curtain wall, or of parts thereof, which faces the bearing structure of the building, while with the term "outer" we mean the opposite side.

To be more exact, the method to assemble the closure profiles provides, after having assembled the relative covering sheet, a first step wherein the closure profile is coupled frontally with the relative segment of curtain wall, engaging its second attachment means with the first attachment means of the relative cross-piece or upright. A first sealing means, or packing, is associated with a first edge of the closure profile, and is taken into contact with a relative covering sheet. Then, the closure profile is rotated, in a direction from the inside towards the outside with respect to the curtain wall, around an axis that passes substantially through the point of engagement of the first and second attachment means, exploiting the partial elastic deformation of the first sealing means that is pressed against the sheet. Finally, a second sealing means is positioned in correspondence with the second edge of the closure profile opposite the first, and rests upon another covering sheet, thus defining the stable assembly position of the profile.

In one form of embodiment, the first attachment means associated with the cross-piece or upright consist of a strip, or bar, arranged longitudinally parallel to the relative cross-piece or upright; the strip is provided, along at least part of its inner edge, with a shaped profile that is configured to be inserted in snap-in manner into a mating seating, partly hollow, made on the relative upright or cross-piece. At least part of the outer edge of the strip comprises said first attachment means which, in a

- 4 -

preferential embodiment, are shaped substantially like a hook extending outwardly, and are able to cooperate with said second hook-shaped attachment means provided on the inner side of the closure profile.

5 The strip is preferentially made of plastic material and, apart from its function as an attachment element for the closure profiles, it also has the function of a thermal bridge in order to limit the transmission of hot or cold between the inside and outside of the curtain wall.

10 According to another characteristic of the present invention, on the ends of each cross-piece there is a stopper element on which at least a drainage hole is made, from which the water that accumulates and/or filters inside the cross-piece can drain. The cross-piece, in
15 correspondence with this drainage hole, has a shaped part along which the inner condensation collects, in order to be discharged through the drainage hole provided on the stopper element and from here through a relative upright.

 At least a discharge platelet is also provided,
20 arranged as an extension of the strip defining the attachment means for the closure profile and below the drainage hole; the platelet is shaped so that the water and condensation that drain both from the strip and also from the channel of the cross-piece through the drainage hole
25 are conveyed towards the adjacent upright, which therefore performs a substantial function as a gutter and downspout, and through this are discharged downwards.

 According to the invention, in an intermediate position between the outer edge and the inner edge, the
30 strip defines a longitudinal hollow that functions as a conveyor and channel for the water and condensation.

 The assembly method described above allows a rapid and simple snap-in assembly of the closure profile with front

- 5 -

coupling, in a single operation and without needing previously made holes. Moreover, the conformation of the attachment means provided in the uprights and/or cross-pieces of the curtain wall encourages a rapid outflow of the filtered water, thus preventing the formation of mold or infiltrations into the curtain wall itself.

BRIEF DESCRIPTION OF THE DRAWING

These and other characteristics of the present invention will become apparent from the following description of a preferential form of embodiment, given as a non-restrictive example, with reference to the attached drawing wherein:

- fig. 1 is a three-dimensional view of a curtain wall according to the invention;
- figs. 2a and 2b show respectively in transverse and longitudinal section part of the curtain wall in fig. 1;
- figs. 3a-3d show four steps of the method to assemble the closure profile in the wall according to the invention;
- fig. 4 shows a step to assemble a stopper element to a cross-piece of the curtain wall in fig. 1;
- fig. 5 is a three-dimensional view of a cross-piece of the curtain wall in fig. 1;
- fig. 6 is a perspective view of a coupling segment between an upright and a cross-piece functioning as a condensation collector in the wall according to the invention.

DETAILED DESCRIPTION OF THE DRAWINGS

With reference to fig. 1, a curtain wall 10 consists of a reticular supporting structure comprising a plurality of uprights 11, arranged in use substantially vertical, and a plurality of cross-pieces 12 arranged in use substantially horizontal.

In the quadrangular spaces defined between the

- 6 -

uprights 11 and the cross-pieces 12, covering panels, for example glass sheets 13, are assembled. To be more exact, as shown in fig. 2a, in correspondence with a relative cross-piece 12 every glass sheet 13 has a lower edge resting on a supporting blade 15, while the upper edge of the adjacent sheet 13 is elastically clamped by a retaining blade 16. The blades 15 and 16, which normally consist of aluminum profiles at least partly covered by plastic material, are assembled opposite each other inside the front part of each cross-piece 12; they are only shown in fig. 2a, whereas they have been omitted from the other figures to facilitate understanding.

On the front side of the curtain wall 10 closure profiles 17 are assembled, arranged horizontal and vertical to cover the gaps that form between two adjacent glass sheets 13.

In this case, each closure profile 17 has a substantially T-shaped transverse section with the leg of the T-shape facing towards the inside, and its central leg ends in a hook 19 facing downwards. The closure profile 17 also has a first edge 25 on which a first packing 26 is able to be assembled in snap-in manner, and a second edge 27, opposite the first, on which a second packing 29 is able to be mounted also in snap-in manner. The two packings 26 and 29 are advantageously of the lip type and are normally kept in contact with the relative glass sheets 13, so as to prevent water from filtering inside the uprights 11 and/or cross-pieces 12.

On every upright 11 and on every cross-piece 12, for the whole of their length, a strip 20 is assembled on whose inner edge a shaping 21 is provided for a snap-in attachment; on the outer edge of the strip 20 there is a hook 22 facing upwards and mating in shape with the hook 19

- 7 -

provided on the closure profile 17.

The strip 20, advantageously made of plastic material or in any case partly elastic, is inserted in snap-in manner inside a mating housing seating 23, at least partly
5 hollow and open towards the outside, made in a central zone of every upright 11 and/or cross-piece 12.

Between the shaping 21 and the hook 22 the strip 20 has a longitudinal hollow 30 functioning as a channel to discharge the filtered water and the condensation that has
10 formed. The longitudinal hollow 30 is located in a substantially intermediate zone between the blades 15 and 16, and occupies substantially the entire length of the relative strip 20.

Each upright 11 and each cross-piece 12 also include,
15 located in a known manner in hollows provided in the relative front edges, two packings 31 associated with the inner side of the sheet 13.

At the lateral ends of each cross-piece 12 there are two stoppers 32 (figs. 2b, 4 and 5), attached by means of
20 assembly plates 33 and including a through drainage hole 35, and a discharge platelet 36 arranged as an extension of the strip 20 and below the drainage hole 35.

The assembly plates 33 include threaded holes 42 into which respective grub screws 43 are inserted (figs. 2b and
25 4) that press against a vertical wall of the relative cross-piece 12.

The assembly plates 33 also include an attachment tooth 40 that anchors on a mating tooth-like profile of the relative upright 11 and that ends frontally in a wedge-shaped segment 34, arranged outside the respective stopper
30 32; the segment 34, by inserting a grub screw 41 in a threaded hole 44 provided in a position adjacent to the attachment tooth 40, takes the stopper 32 mounted on the

cross-piece 12 to press against the upright 11.

The sequence to assemble the cross-pieces 12 to the uprights 11 provides firstly to insert the stopper 32 at one end of the cross-piece 12, inserting the plates 33 into
5 the respective seatings and clamping them in contrast with the pre-assembled grub screws 43; then, the cross-piece 12 is inserted on the upright 11, attaching the tooth 40 and completing the coupling by means of pressure tightening the pre-assembled grub screw 41. In this case too it can be
10 seen that the assembly of the components of the wall 10 does not require any prior operation to make holes, and is carried out with extremely simple and rapid operations.

The drainage hole 35 (fig. 5) is located in correspondence with a collection and discharge channel 37,
15 defined by a shaping provided in the upper part of the cross-piece 12 on which the stopper 32 is assembled.

The platelet 36 has a raised edge 39 and has its base surface horizontal or, according to a variant, slightly inclined towards the inside, so as to convey inside a
20 relative upright 11 both the water that flows on the base surface of the strip 20, and also that which collects in the channel 37 and which drains through the hole 35 of the stopper 32.

With this solution, the water and condensation do not
25 stagnate inside the cross-pieces 12 but are quickly and constantly discharged.

Figs. 3a, 3b, 3c and 3d show the sequence of assembly of a closure profile 17 with respect to a respective upright 11 and/or cross-piece 12, subsequent to the
30 positioning of the relative sheets 13.

The figures describe the assembly with respect to a cross-piece 12, but the assembly of the profile on an upright 11 is substantially identical, wherein the meaning

- 9 -

of the terms "up" or "down" and derivatives thereof must be read as "right" or "left" and derivatives thereof.

Firstly, after having positioned the relative upper sheet 13 resting it on the blade 15 (see fig. 2a), the closure profile 17 is inserted frontally, slightly inclined downwards with respect to the cross-piece 12, with the hook 19 arranged in this case above the hook 22 of the strip 20, and with the upper packing 26 assembled on a first upper edge 25 in contact with the respective upper glass sheet 13 (fig. 3a).

In the following step (fig. 3b), the hook 19 of the closure profile 17 is engaged with the hook 22 of the strip 20, and the closure profile 17 is rotated from the inside to the outside, pivoting on the hook 19. The rotation is allowed by the elastic deformation of the upper packing 26 when pressed against the relative sheet 13. At the end of this operation (fig. 3c), a second lower packing 29 is inserted on the second lower edge 27 of the profile 17, in such a manner (fig. 3d) as to stabilize the position of the profile 17 with both packings 26 and 29 pressed against the respective glass sheets 13.

It is therefore simple and quick to assemble the profile 17, it requires only a single operation and does not need any previously made holes.

If water should filter through the packings 26, 29 and 31, or if condensation should form inside the cross-piece 12, this is discharged flowing through the channel 37, the hole 35, the platelet 36 and/or the hollow 30, and is then conveyed inside the relative upright 11; this considerably reduces the risk of mold forming inside the curtain wall 10.

It is clear, however, that modifications and/or additions of parts or steps may be made to the curtain wall

- 10 -

10 and the assembly method as described heretofore, without departing from the field and scope of the present invention.

For example, the two hooks 19 and 22 can be replaced
5 by other equivalent snap-in attachment systems. The clamping of the strip 20 to the relative upright 11 or cross-piece 12 can also be achieved with equivalent means to those shown here. The grub screws 41 and 43 could be replaced by pins, blocks or other identical or equivalent
10 clamping means.

Although a solution is shown here wherein there are two assembly plates 33 of the stoppers 32, it is clear that a single plate 33 could be provided.

It is also clear that, although the present invention
15 has been described with reference to specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of curtain wall and its assembly method, all of which shall come within the field and scope of the present invention.

- 11 -

CLAIMS

1. Method to assemble a curtain wall comprising a reticular supporting structure, provided with uprights (11) and cross-pieces (12), and covering elements (13) attached to said supporting structure, said uprights (11) and said cross-pieces (12) including first attachment means (22) for closure profiles (17) positioned between two adjacent covering elements (13) and provided with mating second attachment means (19), characterized in that it provides:
- 5 - a first step of positioning said closure profiles (17) frontally with respect to said supporting structure in order to engage said second attachment means (19) with said first attachment means (22);
 - 10 - a second step of rotating towards the outside said closure profiles (17) around an axis passing through the point of engagement between said first (22) and said second (19) attachment means, compressing first sealing means (26) associated with a first edge (25) of said closure profile (17) against the first of said covering element (13); and
 - 15 - a third step of positioning second sealing means (29) on a second edge (27) of said closure profile (17) in order to stabilize the positioning thereof by resting said second sealing means (29) against the other covering element (13).
 - 20
 - 25
2. Assembly method as in claim 1, characterized in that it provides a first step of coupling stoppers (32) to the relative cross-piece (12), by inserting at least one plate (33) solid with the relative stopper (32) into a mating seating provided in the relative cross-piece (12), and attaching it under pressure by means of clamping means (43), and a second step of coupling said cross-piece (12) to a relative upright (11) by means of anchoring an
- 30

- 12 -

attachment element (40) solid with said stopper (32) to a relative profile provided in said upright (11) and attaching it under pressure by means of clamping means (41).

5 3. Curtain wall comprising a reticular supporting structure, provided with uprights (11) and cross-pieces (12), and covering elements (13) attached to said supporting structure, said curtain wall comprising a longitudinal element (20) arranged substantially parallel
10 to the relative upright (11) or cross-piece (12) and including on at least part of its inner side a shaping (21) able to couple in snap-in manner with a mating seating (23) made in the relative upright (11) or cross-piece (12) and on at least part of its outer side a first attachment means
15 (22) able to engage with a mating second attachment means (19) of a closure profile (17) able to be positioned, in snap-in manner and by means of rotation, between two adjacent covering elements (13) characterized in that said longitudinal element (20), in an intermediate position
20 between said shaping (21) and said first attachment means (22), has a longitudinal hollow (30) able to perform a function of conveying and channeling water and condensation.

4. Curtain wall as in claim 3, characterized in that said
25 first (22) and said second (19) attachment means have a substantially hook-type conformation.

5. Curtain wall as in claim 3 or 4 inclusive, characterized in that, in correspondence with the ends of each of said cross-pieces (12), it comprises a relative stopper (32)
30 provided with at least a drainage hole (35) and a discharge platelet (36) arranged as an extension of said longitudinal element (20) and below said drainage hole (35).

6. Curtain wall as in claim 5, characterized in that said

- 13 -

drainage hole (35) is located in correspondence with a channel (37) defined by a shaping made in the upper part of a relative cross-piece (12).

7. Curtain wall as in claim 5 or 6, characterized in that
5 each of said stoppers (32) is attached to a respective cross-piece (12) by means of at least an assembly plate (33) including holes (42) into which respective clamping means (43) are inserted under pressure against a segment of a relative upright (11).

10 8. Curtain wall as in any claim from 5 to 7 inclusive, characterized in that each of said stoppers (32) includes snap-in attachment means (40) facing towards a relative upright (11) and at least a hole (44) arranged adjacent to said snap-in attachment means (40) for the insertion of
15 clamping means (41) under pressure against a segment of a relative upright (11).

9. Curtain wall as in claim 8, characterized in that said snap-in attachment means (40) include at the front a wedge-shaped segment (34) able during use to compress a relative
20 stopper (32) applied on a cross-piece (12) against the upright (11) with which said cross-piece (12) is coupled.

10. Curtain wall as in claim 5, characterized in that said platelet (36) has a raised edge (39) and has its base surface able to convey inside a relative upright (11) both
25 the water that accumulates on the base surface of said longitudinal element (20), and also the water that drains from said drainage hole (35).

1/6

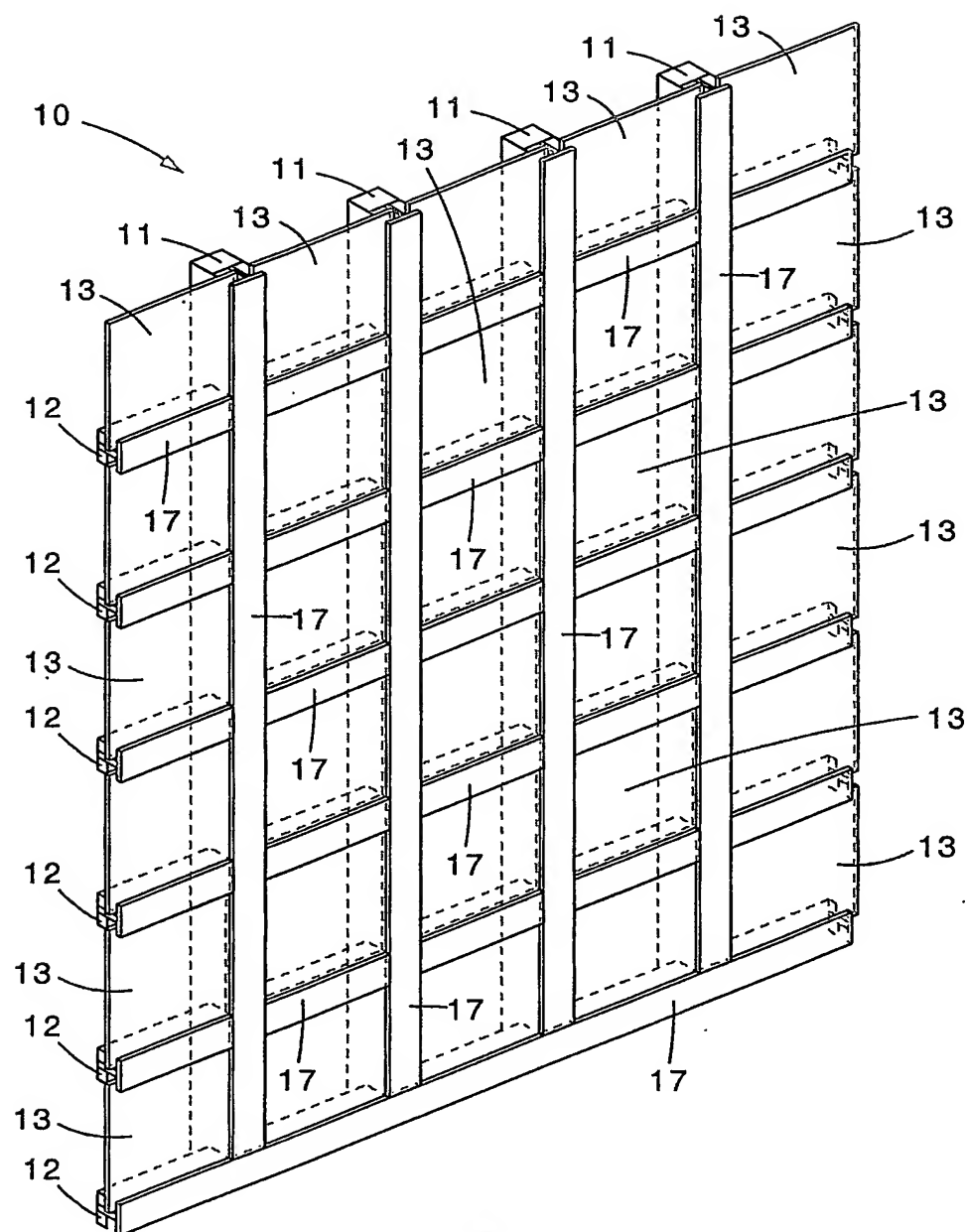
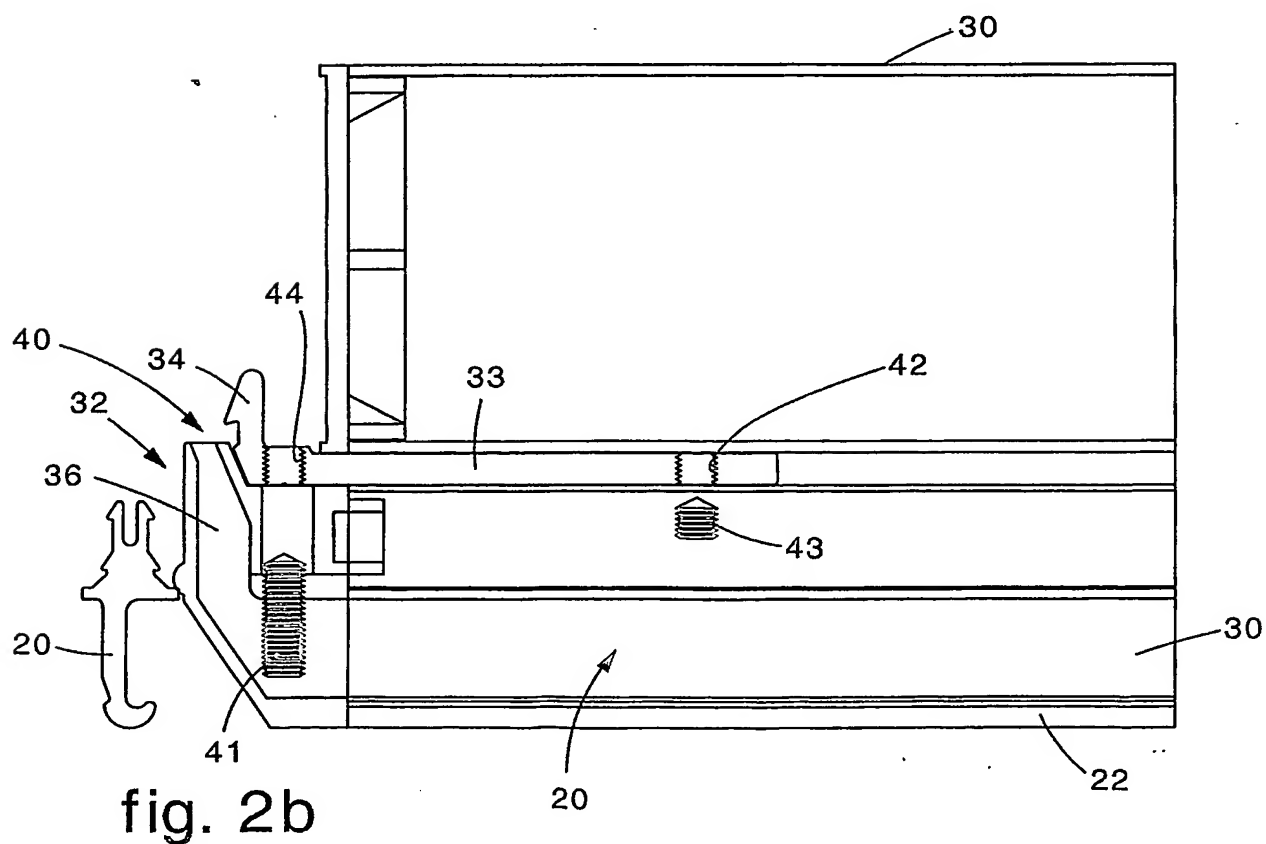
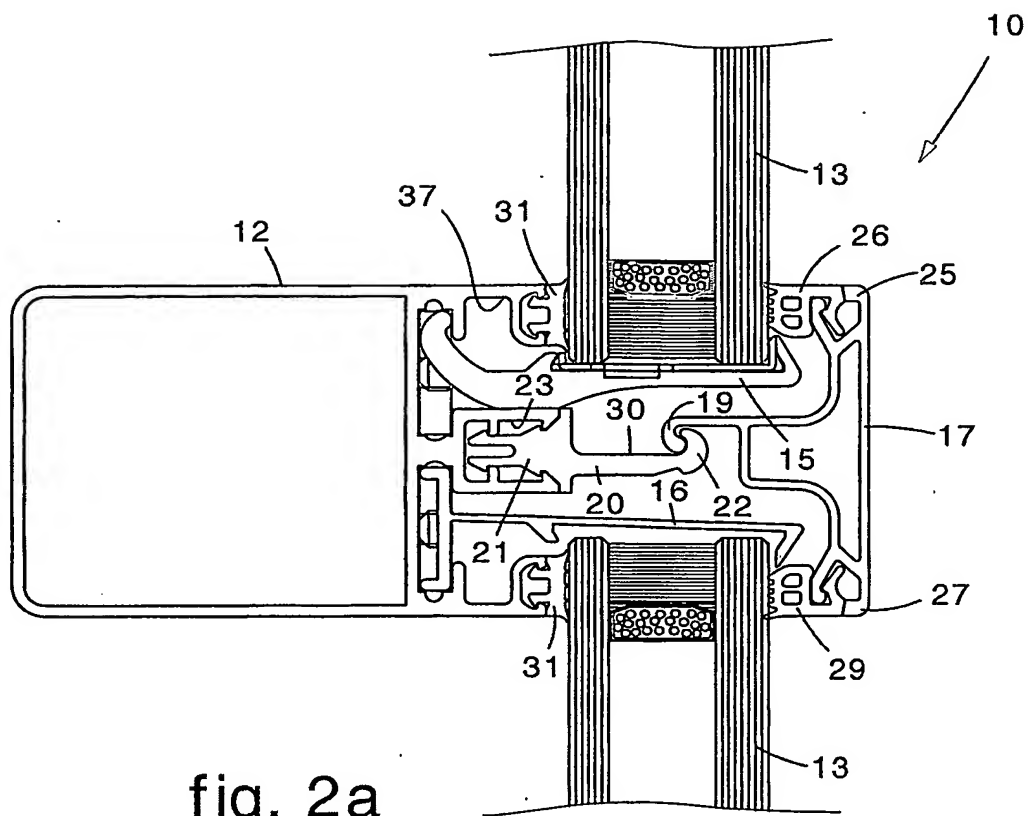


fig. 1

2/6



3/6

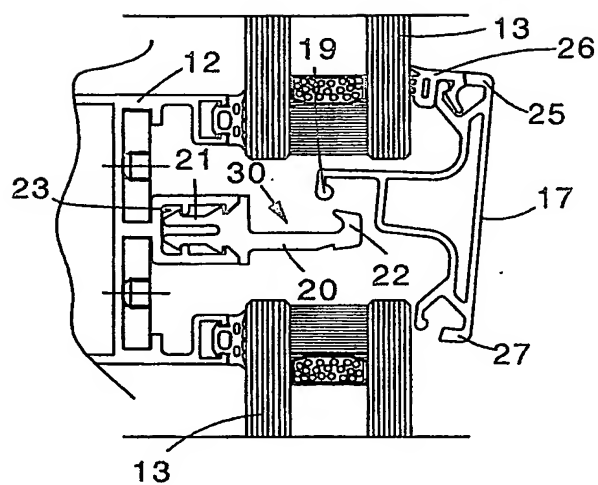


fig. 3a

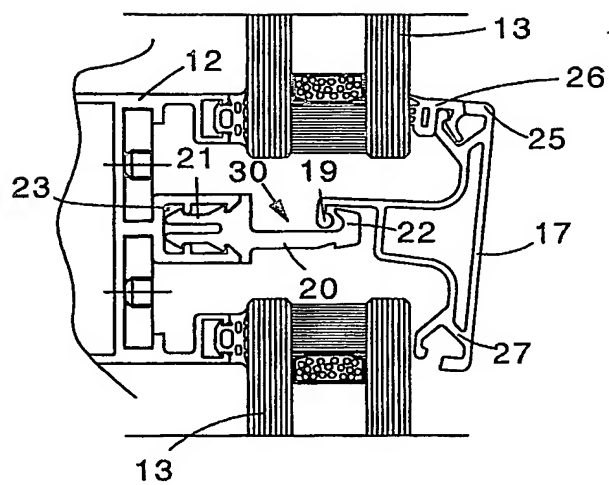


fig. 3b

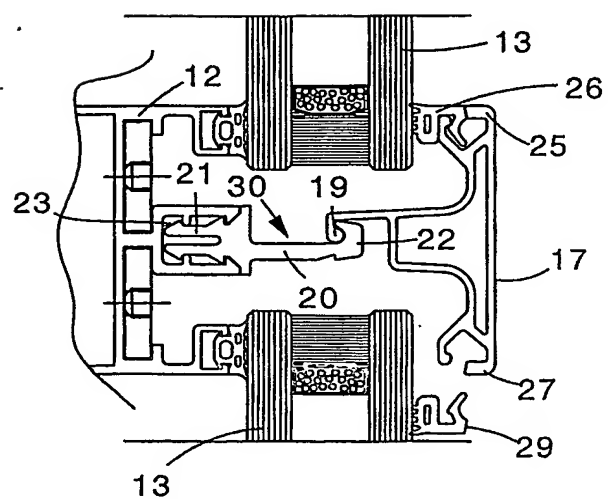


fig. 3c

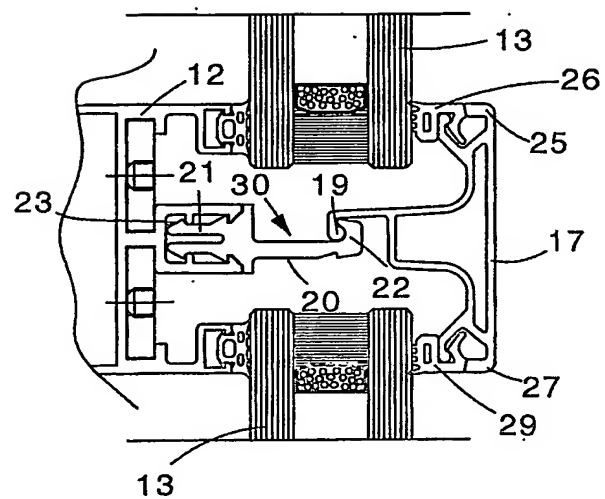


fig. 3d

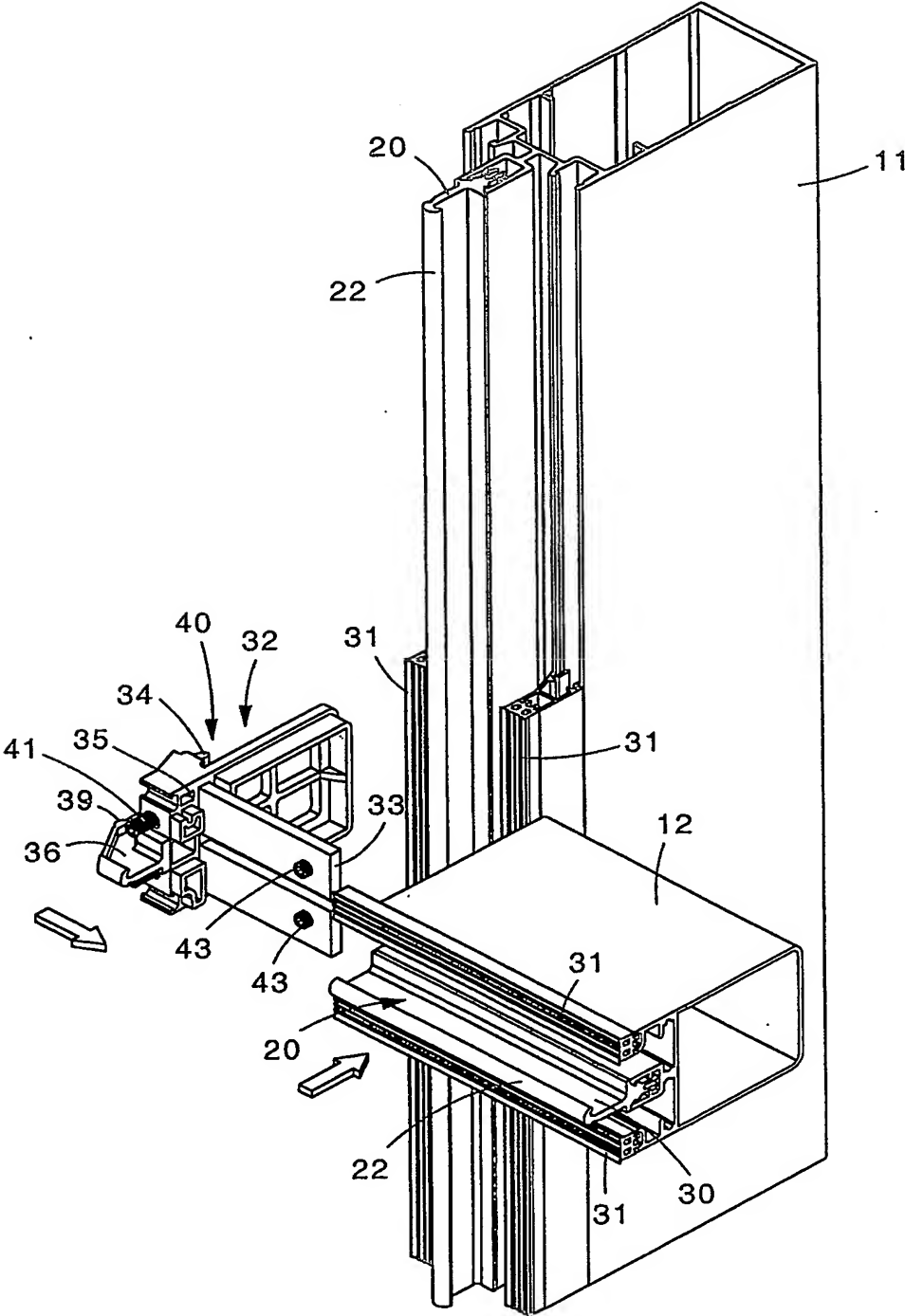


fig. 4

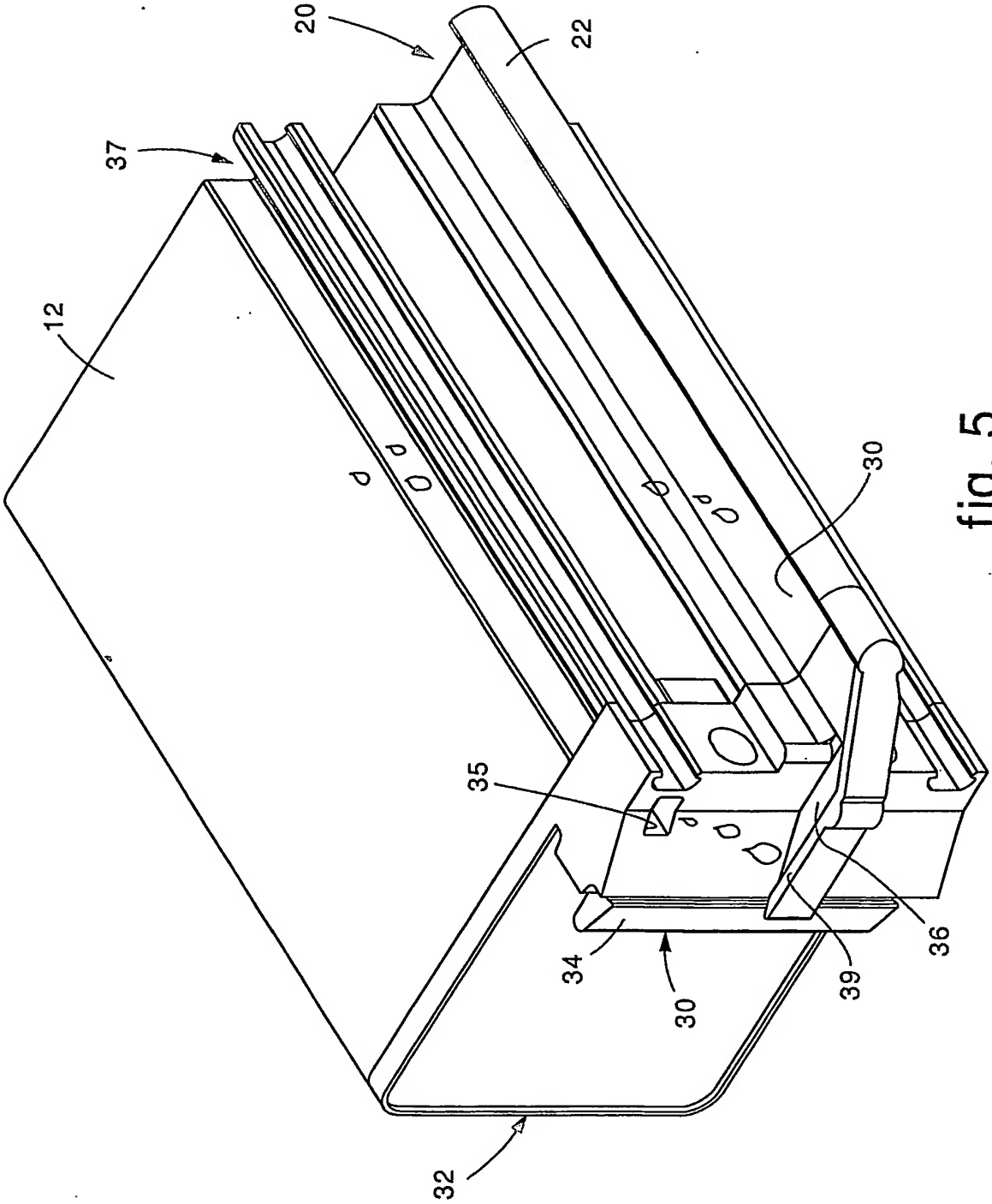


fig. 5

6/6

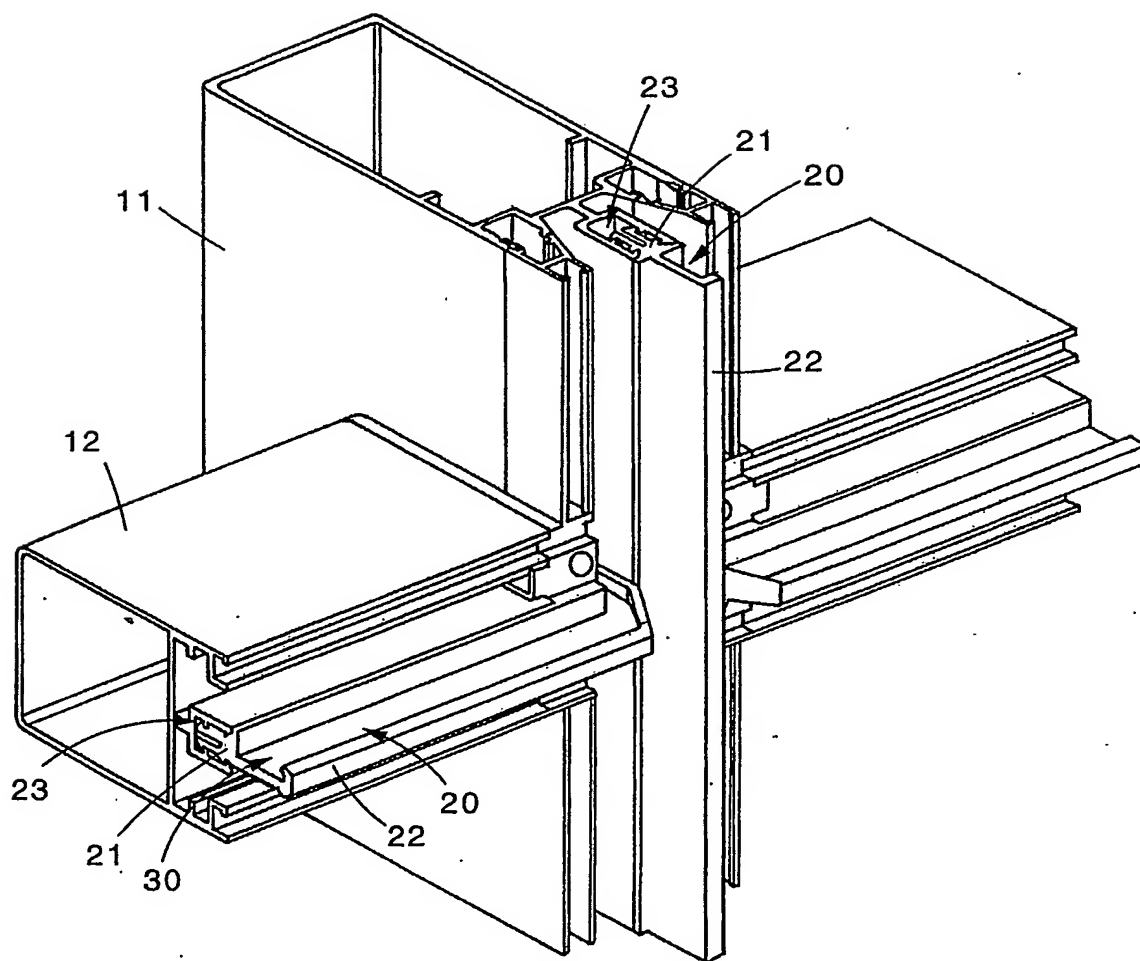


fig. 6

INTERNATIONAL SEARCH REPORT

International Application No

/IB2004/000754

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 E04B2/96

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 E04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	EP 0 644 311 A (EBERSPAECHER J) 22 March 1995 (1995-03-22) column 3, line 29 -column 4, line 50; figures 1-4	3,4 1
X A	US 4 672 784 A (POHLAR TRENT L) 16 June 1987 (1987-06-16) column 4, line 21 - line 25 column 8, line 60 - line 68; figure 6A	3,4 1

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

G document member of the same patent family

Date of the actual completion of the international search

23 June 2004

Date of mailing of the international search report

30/06/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Zuurveld, G

INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB2004/000754

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
EP 0644311	A	22-03-1995	DE	4331963 A1	23-03-1995
			EP	0644311 A2	22-03-1995
<hr/>					
US 4672784	A	16-06-1987	NONE		
<hr/>					